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WORKING NOTES AND BIBLIOGRAPHY ON CENTRAL PLACE STUDIES, 1965–1969

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Introduction

These notes are designed to pull together in one source the bulk of the work on central place studies published since the Second Edition of Berry and Pred (Central place studies, Regional Science Research Institute, 1965). A few items published before 1965 and excluded from that source are included here and a few items published in 1970 have also been included. As is usual with such bibliographies, it would be foolish to claim 100% comprehensiveness and apologies are extended to those authors under-represented, not represented at all, or misrepresented in the annotations: presumably corrections and additions can be made with time and experience.

The categorization follows broadly the simple and probably over-worked paradigm of 'structure-process-change'. To these major divisions are added categories describing the applications of studies to the analysis of planned and planning systems and theoretical extensions. At the same time, the question of scale has been only crudely recognized in differentiating studies of inter-urban aspects from those of intra-urban significance. Hence, the framework is basically conventional. To some extent at least, this derives from the nature of research and published work since 1965: innovations and breakthroughs are very much the exception and so scant as to shine forth like beacons from the fog of repetition and inconsequence that unfortunately characterize most of the research reported here.

The inadequacy of the structure-process-change model results from the inherently artificial separation of the three aspects of the phenomena.

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This is probably universally accepted, along with an acceptance that the interdependence of structure and process changes in some way at different scales of analysis. A major contribution of Harvey's recent work (Explanation in geography, London, Arnold, 1969) is in his insistence on the necessity for geographers to come to terms with 'non-geographical' research and methodology in order to understand the processes which shape, and are shaped by, what we loosely term 'spatial structure'. Without the flexibility of a controlled laboratory environment, social geography can only be an inferential science and progress in that direction is inexorably linked to the development of the other social sciences. Ideally therefore, a characterization of research/knowledge of tertiary activity systems will be first and foremost describable along the two continua of scales in the space and time dimensions. However, the student and research worker faces enormous tasks in getting to grips with the literature: whatever his frame of reference, it is hoped that the categorization suggested here and the various working notes accompanying the entries will provide some indication of where to begin in his attempt to 'see the wood for the trees'.

The bibliography which follows was prepared with John Carney (University of Cambridge) and Isobel Thubron (University of Oxford). Items follow alphabetically and are categorized at the end. These notes appeared previously as Discussion Paper No. 8 of the Department of Geography, University of Toronto, (August 1970). They represent a revised version of Working Note 5 of the author's doctoral dissertation (Consumer Behaviour and the Tertiary Activity System, unpub. D.Phil., University of Sussex, 1970).

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ABIODUN, J. O., (1967). "Urban hierarchy in a developing country", Economic Geography, 43 (4), 347-367.

Principal components of central place functions and the calculation of "functional distances" between central places. Established texonomic procedures are then employed to identify the central place hierarchy.

ABIODUN, J. O., (1968). "Central place study in Abeokuta Province South-western Nigeria", Journal of Regional Science, 8(1), 57-76.

Identification of a central place hierarchy in a developing country. A principle components analysis of 30 central place functions provides the basis for grouping settlements. No "fixed k" principle can be identified due mainly to "the historical and geographical conditions of the province", and the tendency for new functional types to gravitate to highest order centres.

AHMAD, Q., (1965). Indian cities: characteristics and correlates, University of Chicago, Department of Geography Research Paper 102.

Components analysis of 62 variables for 102 Indian cities, with populations over 100,000. Seventy per cent of combined variance is taken up by 10 components. The four major dimensions are: size, functional specialization, population change and population density.

AHMAD, Q., (1967a) "Distribution pattern of urban centres in Pakistan", Pakistan Geographical Review, 22, 1-8.

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AJO, R., (1969). "Response of geographical system to repeated psychological shock", Geografisker Annaler, Series B (1), 8-22.

ALCALY, R. E., (1967). "Aggregation and gravity models: Some empirical evidence", Journal of Regional Science, 7(1), 61-73.

AMBROSE, P., (1968). "An analysis of intraurban shopping patterns", Town Planning Review, (39) 327-334.

AMEEM, L., U. ERLANDSSON, (1968). "Delimiting the C.B.D. in small central places", Svensk Geografisk Arsbok, 44, 99-101.

ANDREWS, H. F., (1967). "A note on forecasting shopping demand", Journal, Town Planning Institute, 53(8), 352-354.

Criticism of use and methodology of the gravity/potential model for a study of intraurban shopping trip prediction.

ANDREWS, H. F., (1970). "Consumer behaviour and the tertiary activity system", in A. G. Wilson (ed.) London Essays in Regional Science II, London, Pion Press.

APPLEBAUM, W., (1966). "Methods for determining store trade areas, market penetration, and potential sales", Journal of Marketing Research, III, 127-141.

BAKER, A., (1969). Models of spatial behaviour in urban environments, University of Toronto, Centre for Urban and Community Studies, Research Papers Series, No. 15.

BALL, J. M., (1966). "Changing urban functions of Tepic Nayarit, Mexico", Revista Geografica Brazil, 64, 123-135.

BARNUM, H. G., (1966). Market centres and hinterlands in Baden-Wurtenberg, University of Chicago, Department of Geography Research Paper 103.

BENGTSSON, R., (1964). "Location of retail stores in Lund", Svensk Geografisk Arsbok, 40, 116-128.

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BEREZOWSKI, S., (1967). "Methodology of central place study in Poland", Revue Géographique de l'Est, 7(3), 365-372.

Review of the role of central place studies in Poland, including criticisms of their applicability in national planning.

BERRY, B. J. L., (1965). "The retail component of the urban model", Journal, American Institute of Planners (2), 150-155.

Central place relationships of Chicago's planned and unplanned shopping centres. Factor analysis determines basic characteristics of central places and application of the model to planning processes is discussed.

BERRY, B. J. L., (1966). Essays on commodity flows and the spatial structure of the Indian economy, University of Chicago, Department of Geography Research Paper 111.

Analysis of interegional and intermetropolitan flow patterns and identification of the central place system. A general field theory for the study of spatial interaction is advanced and a dyadic formulation of canonical correlation is used to supplement factor analytic and regression methods.

BERRY, B. J. L., (1967a). "Grouping and regionalization: an approach to the problem using multivariate analysis", in Garrison, W. and Marble, D., Quantitative Geography I, Northwestern University Studies in Geography, 13, 1967, 219-251.

Three multivariate procedures (direct factor analysis, distance-scaling, cluster analysis) are used to characterize 36 business centres by 34 variables.

BERRY, B. J. L., (1967b). Geography of market centres and retail distribution, Englewood Cliffs, N.J., Prentice-Hall.

Central place theory is introduced inductively from studies of central place functional range and shopping trips in the mid-West. The intra-urban applications are developed via Chicago data. Extension of central place theory are summarized, cross-cultural examples portrayed and links with marketing geography and planning are suggested.

BERRY, B. J. L., (1968a). "Interdependency of spatial structure and spatial behavior: a general field theory formulation", Papers and Proceedings, Regional Science Association, 21, 205-227.

BERRY, B. J. L., (1968b) "A synthesis of formal and functional regions using a general field theory of spatial behaviour", in B. J. L. Berry and D. F. Marble (eds.) Spatial Analysis, Englewood Cliffs, New Jersey, Prentice-Hall, 419, 429.

BERRY, B. J. L., and M. J. WOLDENBERG, (1967). "Rivers and central places: analogous systems?", Journal of Regional Science, 7(2), 129-139.

The similarities between the organization and relationships between parameters in river systems and central place systems theoretic framework. Previous misconstructions of systematic central place features (e.g. entropy and rank-size rule, macroscopic negentropy) are clarified and points in Dacey's contribution (1966b) are questioned.

BIRCH, B., (1967). "The measurement of dispersed patterns of settlement", Tijdschrift voor Economische en Social Geographie, (58), 68-75.

BLACKBURN, A. J., (1969). On a class of market share functions, Centre for Environmental Studies, Working Paper 27.

BLOUNT, S., (1964). "Spatial distribution of shoppers around the Valley Shopping Centre of St. Charles, Illinois", Professional Geographer, 16(5), 8-17.

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Identification of customer movements. The range of establishments is then re-subdivided on the basis of locational patterns and types of shopping trip linkage.

BOAL, F. W. and D. B. JOHNSON, (1965b). "The rank-size curve: a diagnostic tool?", Professional Geographer, 17(5), 21-24.

The 1981 rank-size curve for Northern Ireland is projected, given the aims of the Belfast Regional Plan and found to be very similar to the curve in 1961.

BOBEK, H., (1967). "The hierarchy of central places and their hinterlands in Austria and their role in economic regionalisation", in: MIROSLAV MACKA (ed.), Economic Regionalisation, Prague (Academia), 139-144.

Classification of central places and four orders of centres below Vienna. The size of the central place field is inversely related to the degree of non-agricultural development. Old established fields form the basis of post-war regional economic development.

BOUDEVILLE, J., (et. al.), (1965). La hiérachie des villes en fonction de leurs activités de commerce et de service, Paris, (Gautier-Villars).

Statement of central place theory and application to settlements in northern France. The Lyon central place subsystem is studied as an example.

von BOVENTER, E., (1963). "Towards a unified theory of spatial economic structure", Papers and Proceedings, Regional Science Association, 10, 163-187.

1. Agricultural and urban location theory; 2, basic characteristics of the models of spatial structure by W. Christaller and A. Lösch; 3, the choice of a site: general and specific statements; 4, applications to simple spatial structures.

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An attempt to integrate theories of agricultural land use (von Thünen), settlement distribution and urban land use (Alonso) and recreational travel behaviour (Christaller, 1964).

von BOVENTER, E., (1969). "Walter Christaller's central places and peripheral areas: central place theory in retrospect", Journal of Regional Science, 9(1), 117-124.

BOWLBY, SOPHIA, (1969). "Pattern of change in the accessibility of retail stores to urban households", Research Report No. 56, Department of Geography, Northwestern University, Evanston, Illinois.

A study of changes in the spatial characteristics of the opportunity set (Marble and Bowlby, 1968) of retail stores for the household locations in Cedar Rapids (1949-1959).

BOYCE, D. E., (1965). "The effect of direction and length of person trips on urban travel patterns", Journal of Regional Science, 6(1), 66-80.

A mixed, three-way analysis of variance of interzonal trip volume and direction using CATS data, distinguishing between transit network trips (volume significantly related to direction) and trips on the arterial network.

BOYCE, R. and W. CLARK, (1963). "Selected spatial variables and central business district retail sales", Papers and Proceedings, Regional Science Association, 11, 167-193.

BRUNN, S. D., (1967). "The inertia effect in measuring threshold populations", Southeastern Geographer, 7, 6-12.

Comparison of ranges of commodities in a growing prosperous area (N.W. Ohio) and a "depressed" area (S.E. Ohio). Discussion of the inertia of lower order central place functions in the declining area, while higher order goods are more responsive to competition.

BRUSH, J. and H. GAUTHIER, (1968). Service centres and consumer trips: studies on the Philadelphia Metropolitan fringe, University of Chicago, Department of Geography Research Paper 113.

BUCKLIN, L. P., (1966). "Testing propensities to shop", Journal of Marketing, 30(1), 22-27.

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Examination of traditional parameters in gravity/potential formulations of shopping trips. Discriminant analysis identifies other important parameters in investigating consumer behaviour.

BUISSINK, J. D., et. al., (1967). "Some aspects of the development of the shopping center of the city of Utrecht", in Heinemijer, W. T., et. al., (eds.) Urban Core and Inner City, 237-255.

BUNGE, W., (1966). Theoretical Geography, Lund, Series C, No. 1 (2nd ed.), Chapter 6, 134-174. Experimental and theoretical central place.

BYLUND, E., (1965). "Theoretical considerations regarding the distribution of settlement in inner north Sweden", Geografisker Annaler, 42, 225-231.

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CARRUTHERS, W. I., (1967a). "A classification of service centres in England and Wales", Geographical Journal, 122.

CARRUTHERS, W. I., (1967b). "Major shopping centres in England and Wales 1961", Regional Studies, 1(1), 65-81.

Assessment of the urban hierarchy in England and Wales using central area data from the Census of Distribution. Indices used to differentiate rank are based on amount and type of trade, estimated net attraction beyond administrative area and provision of selected shopping facilities. Two ranked orders are determined below London.

CARTER, H., (1968). "Urban systems and town morphology", in CARTER, H., et. al., (eds.) Geography at Aberystwyth, 219-234.

CARTER, H., and M. DAVIES, (1963). "The hierarchy of urban fields in Cardingshire, Wales", Tijdschrift voor Economische en Social Geographie, 54, 181-186.

CHATERJEE, A..H., (1965). "Hinterland of a symbiotic city: a case study", Geographical Review of India, 27, 2, 55-71.

Problems in defining the field of Howrah City using "westernized" indices.

CHRISTALLER, W., (1964). "Some considerations of tourism location in Europe: ...", Papers and Proceedings, Regional Science Association, 12, 95-105.

Development of a "theory of the periphery" for tourism activities in apposition to the central place model and its distortions due to eccentric industrial agglomeration locations.

CHRISTALLER, W., (1965). "The advantages of a space-economical theory for the practice of regional planning", Ekistics, 20(119), 223-227.

A summary restatement of the original model in terms of its applicability in approaching particular planning goals.

CHRISTALLER, W., (1966). "Applied geography - spatial models", Nürnberger Wirtschafts und Sozial geographische Arbuten, 5, 35-38.

The place of the central place model in "action-orientated" research, e.g., reorganization of Swedish parishes, settlement plans on the Noordest polder and new settlement patterns in Iraq.

CLARK, W., (1967). "The spatial structure of retail functions in a New Zealand city", New Zealand Geographer, 23(1), 23-33.

Identification of service centre hierarchy in Christchurch and comparisions with Berry's study of Spokane.

CLARK, W., (1968). "Consumer travel patterns and the concept of range", Annals, Association of American Geographers, 58, 386-396.

CLARK, B. and L. BOLWELL, (1968). "Attractiveness as part of retail potential models", Journal, Town Planning Institute, 54(10), 477-478.

CLAWSON, M., (1966). "Factors and forces affecting the optimum rural settlement pattern in the United States", Economic Geography 42, (4), 283-293.

A discussion of many factors involved in the delimitation of a pattern of rural settlement, maximising satisfaction at lowest cost. A cost benefit approach is suggested to select the optimal pattern.

COHEN, S. B. and G. K. LEWIS, (1967). "Form and functioning in the geography of retailing", Economic Geography, 43(1), 1-42.

Effects of changing form of service centres on functioning and trip patterns. Empirical studies of Boston and Detroit.

COLE, H. R., (1966). "Shopping assessments at Haydock and elsewhere: a review", Urban Studies, 3(2), 193-204.

CORDEY, HAYES M., (1968). Retail location models, Centre for Environmental Studies-Working Paper, 16.

CURDES, G., (1967). "On a method for analysing retail centrality and efficienty in town and regional planning", in Heinemijer, W. L., et. al., Urban Core and Inner City, 423-438.

CURRY, L., (1964). "The random spatial economy: an exploration in settlement theory", Annals, Association of American Geographers, 54, 138-146.

CURRY, L., (1967). "Central places in the random spatial economy", Journal of Regional Science, 7(2), supplement, 217-238.

An attempt to come to grips with spatial autocorrelation in consumer behaviour partly through information theory. The analysis of processes operating in spatial series is explored through the notion of "local isotropy" by analogies with the behaviour of variables in time series. It is thus suggested that spatial behaviour is ergodic by nature, and if stationarity is assumed for the processes under examination, behaviour at a point through time should be analagous to behaviour at many points at an instant in time.

CURRY, L., (1969). "A 'Classical' approach to central place dynamics", Geographical Analysis, 3, 1, 272 et seq.

DACEY, M. F., (1964a). "A family of density functions for Lösch's measurements on town distribution", Professional Geographer, 10(1), 5-7.

DACEY, M. F., (1964b). "Modified Poisson probability law for point pattern more regular than random", Annals, Association of American Geographers, 54(4), 559-565.

Derivation of a probability distribution to agree more closely with the Christaller landscape and isotropic assumption. The process is hence assumed to be 'dispersive' (as in Dacey, 1966a) and is not applicable for situations portraying contagious distribution processes, e.g. metropolitan sprawl.

DACEY, M. F., (1964c). "Two dimensional point patterns: a review and interpretation", Papers and Proceedings, Regional Science Association, 13, 41-54.

Derivation of distances to jth nearest neighbour in a generated Poisson point field as a chi-square variable with 2j degrees of freedom (see also, Kendall, M. G. and Moran, P.A.P., Geometrical Probability, N.Y. Hafner, 1963, pp. 37-38). Density of points per unit area, λ, is held constant and the random point pattern is hence termed 'homogenous'. Part II provides tabulations of central moments, measures of skewness and kurtosis for distance from an arbitrary locus to jth nearest point and n nearest points. Tabulated values for j, n = 1(1)25(5)50(10)100. Part III identifies limiting properties and the asymptotic relationship between the discrete ('homogeneous') random point pattern and the continuous uniform distribution.

DACEY, M. F., (1964d). "A note on some number properties of a hexagonal hierarchical plane lattice", Journal of Regional Science, 5(2), 63-67.

The Christaller/Lösch central place point patterns are formulated in terms of vector geometry as illustrated by extensions of the work of Dirichlet (1850): related to Lösch (1954), fig. 33, p. 128.

DACEY, M. F., (1965a). "An interesting number property in central place theory", Professional Geographer, 17, 32-33.

DACEY, M. F., (1965b). "The geometry of central place theory", Geografiska Annaler, 47B, (2), 111-124.

The relationship between central place and market area is identical to that of a lattice point at the centre of a Dirichlet polygon, and Lösch's problem of maximizing demand in a purely competitive spatial system in equilibrium is analogous to the geometrical problem of finding 'the tesselations of Dirichlet regions with maximum packing density".

DACEY, M. F., (1965c). "Order distance in an inhomogeneous random point pattern", Canadian Geographer, 9(3), 144-153.

Complement to Dacey (1964c). 'Inhomogeneity' in the random point pattern is derived by drawing the density parameter, λ , from a gamma distribution: in the 'homogeneous' case, λ is constant. The resulting compound probability distribution of points is given as the Polya-Eggenberger distribution. Greater variance of distance is found in the inhomogeneous pattern than in the homogeneous pattern with the same jth-order neighbour distance.

DACEY, M. F., (1965d). "Measures of distance from a randomly located point to neighbouring lattice points for rectangular and hexagonal point lattices", Research Report No. 15, Department of Geography, Northwestern University, Evanston, Illinois.

DACEY, M. F., (1965e). "Numerical measures of random sets", Research Report No. 16, Department of Geography, Northwestern University, Evanston, Illinois.

Tabulation of moments, moment constants and cumulative distribution functions for distances between two points randomly and independently placed in a line segment, disk sphere and rectangle. Discussion of boundary problems and the use of a toroidal mapping of the point set to overcome these.

DACEY, M. F., (1965f). "Four properties of two-dimensional random point patterns", Research Report No. 17, Department of Geography, Northwestern University, Evanston, Illinois.

DACEY, M. F., (1966a). "A compound probability law for a pattern more dispersed than random and with areal inhomogeneity", Economic Geography, 42, 172-179.

An attempt to generate a central place point probability distribution for the inhomogeneous surface, using the model developed in Dacey, 1965c.

DACEY, M. F., (1966b). "Population of places in a central place hierarchy", Journal of Regional Science, 6(2), 27-33.

The frequency distribution of city population sizes based on basic-service employment ratios is compared to the Beckmann formulation (based on trade area population). The two are similar for a single case only and as a result Dacey questions the link between central place theory and the rank size rule using his derivation.

DACEY, M. F., (1966c). "A probability model for central place locations", Annals, Association of American Geographers, 56(3), 550-568.

Observed central place point locations are seen as the combination of a uniform hexagonal pattern and a random displacement vector over distance and direction. Monte Carlo simulation of the stochastic model incorporating these elements provides a reasonable fit of the distance relation of urban places in Iowa transformed by a toroidal mapping. (See Dacey, 1965e).

DACEY, M. F., (1966d). "A county-set model for the areal pattern of an urban system", Geographical Review, 56(4), 527-542.

Formulation of a stochastic process locating urban places amongst counties, tested in Iowa. Urban places are county seats (0 or 1 per county) and other central places, together located independently between counties. There is a reasonably good fit between the observed distribution and the generated distribution of urban places. More importantly, the model does not originate from classic central place theory notions of range of a good and threshold, but is nevertheless compatible with the traditional theory in that it is concerned with space packing and space relationships between central places.

DACEY, M. F., (1967). "Some properties of order distance for random point distributions", Geografiska Annaler, Series B, 49, 25-32.

DACEY, M. F., (1968a). "A probability model for objects that occur as isolates and in groups of fixed size", Research Report No. 44, Department of Geography, Northwestern University, Evanston, Illinois.

Generalization of the 'county seat model' (Dacey 1966d). Applications to models of urban retail and service activity structure are discussed.

DACEY, M. F., (1968b). "Functions of geographic analysis: I Inhomogeneous random point pattern with continuous variation in point density", Research Report No. 47, Department of Geography, Northwestern University, Evanston, Illinois.

Both a summary and extension of previous work on the 'inhomogeneous' random point pattern (Dacey 1956c, 1966a), in which a variety of probability density functions describing variations in the parameter of point density are discussed. The previous treatment took variation in point density as a gamma function.

DACEY, M. F., (1968c). "An empirical study of the areal distribution of houses in Puerto Rico", Transactions, Institute of British Geographers, 45, 51-69.

Quadrat counts of houses in selected rural areas of Puerto Rico are described adequately by a negative binomial distribution. Of the several known generating models for the class of distributions, none are considered appropriate for studying rural settlement patterns, since a lack of statistical independence in the spatial pattern is revealed by the non-linear relationship between the parameters of the negative binomial model. Some suggestions for a possible alternative model to absorb the features of spatial interdependence are discussed.

DACEY, M. F., (1968d). "A model for the areal distribution of population in a city with multiple population centres", Tijdschrift voor Economische en Sociale Geographie, 59, 232-236.

The areal distribution of urban population around two centres is derived and generalized for multiple population centres, where population classes have a circular normal distribution about each centre (see Dacey 1969a).

DACEY, M. F., (1968e). "A confluent hypergeometric family of discrete probability distributions", Research Report No. 51, Department of Geography, Northwestern University, Evanston, Illinois.

DACEY, M. F., (1969a). "Some spacing measures of areal point distributions having the circular normal form", Geographical Analysis, 1(1), 15-30.

DACEY, M. F., (1969b). "Similarities in the areal distribution of houses in Japan and Puerto Rico", Area, 1(3), 35-57.

Comparision of the quadrat counts of houses in the Tonami Plain area and the Puerto Rican study (Dacey 1968c) reveals good and similar fits by the negative binomial probability law.

DACEY, M. F., (1969c). "Some properties of a cluster point process", Canadian Geographer, 13(2), 128-140.

DACEY, M. F., (1969d). "A hypergeometric family of discrete probability distributions: properties and applications to location models", Geographical Analysis, 1(3), 283-317.

Part I describes the properties of a set of hypergeometric discrete probability distributions, together with more familiar special and limiting forms (Table 2). Part II develops a location model summarized by a three parameter Polya-Eggenberger distribution (see also Dacey 1965c).

DACEY, M. F., (1969e). "Proportion of reflexive nth order neighbours in spatial distribution", Geographical Analysis, 1(4), 385-388.

A correction to the derivation by Clark of the proportion of reflexive nth order neighbours in a random point distribution (Science, 123, 1956, 373-374).

DACEY, M. F., (1970a). "Data for geographic analysis: I cell counts of Puerto Rican settlement patterns", Research Report No. 54, Department of Geography, Northwestern University, Evanston, Illinois.

Incidence matrices of numbers of houses per cell used in Dacey, 1968c, 1969b. Twenty-one matrices of 28 x 24 cells.

DACEY, M. F., (1970b). "Some properties of the superposition of a point lattice and a Poisson point process", Research Report No. 55, Department of Geography, Northwestern University, Evanston, Illinois.

An examination of the entropy analogue for settlement point pattern analysis (Medvedkov, 1967a, 1967b). Dacey's argument suggests that Medvedkov's analysis is of limited application and in fact required the pre-identification of points in the uniform distribution and for cells to be centres on these points, before the Poisson point pattern can be measured.

DACEY, M. F., and A. SEN,(1968). "Complete characterization of the central place hexagonal lattice", Journal of Regional Science, 8(2), 209-213.

Extension of the number theoretic aspects of (central place) hexagonal lattices from previous work (Dacey 1964d, 1965a, 1965b), and also generalizes the approach in Hudson (1967a).

DALY, M., (1968). "The lower Hunter Valley urban complex and the dispersed city hypothesis", Australian Geographer, 106, 472-482.

DALY, M., M. BROWN, (1965). "Urban settlement in Central Western New South Wales", Research Series (N.S.W. Geog. Soc. and University of Sydney, Geography Department) 8.

Application of Berry and Garrison methodology in the Lachlan region of N.S.W., identifies five discrete central place orders. The validity of the threshold concept is questioned in this respect. Temporal patterns of structure reveal increasing dominance of higher order central places but also greater competition between higher order central places. Shopping behaviour is also examined, revealing traditional nested trade areas and trip patterns.

DAVIES, R. J., (1967). "The South African urban hierarchy", South African Geographical Journal, 49, 9-19.

Identification of hierarchy and dimension of distortion from K=3 lattice.

DAVIES, R. L., (1968). "Effects of consumer income differences on the business provisions of small shopping centres", Urban Studies, 5(2), 144-164.

DAVIES, R. L., (1969a). "A note on centrality and population size", Professional Geographer, 21(2), 108-112.

DAVIES, R. L., (1969b). "Effects of consumer income differences on shopping movement behaviour", Tijdschrift voor Economische en Sociale Geographie, 60, 111-121.

DAVIES, W. K., (1965). "Some considerations of scale in central place analysis", Tijdschrift voor Economische en Sociale Geographie, 56(6), 221-227.

Four levels of enquiry are suggested at which the focus of study is the individual good, groups of commodities, types of outlet and all establishments. A centrality index is calculated, applicable for any level of investigation and is illustrated by the Rhondda central place subsystem. The study reiterates that the foundation of central place theory rests on commodity differentiation and not on the differentiation of establishments.

DAVIES, W. K., (1966). "Ranking of service centres: a critical review", Transactions, Institute of British Geographers, 40, 51-56.

DAVIES, W. K., (1967). "Centrality and the central place hierarchy", Urban Studies, 4(1), 61-79.

A standardized centrality index is developed and applied to central places in the Rhondda valley. A hierarchy is identified and its characteristics outlined.

DAVIES, W. K., (1968). "Morphology of central places: a case study", Annals, Association of American Geographers, 58, 91-110.

DAVIES, W. K., and R. BRIGGS, (1967). "Automobile establishment in Liverpool: a steady state distribution", Professional Geographer, 19(6), 323-329.

The pattern of car service functions in Liverpool in three time periods suggests a steady-state distribution despite local deviation amplifying processes.

DAVIES, W. K., J. GIGGS, D. HERBERT, (1968). "Directories, rate books and the commercial structure of towns", Geography, 53, 41-54.

DAVIES, W. K., and G. W. ROBINSON, (1968). "The nodal structure of the solent region", Journal, Town Planning Institute, 54(1), 18-22.

Identification of a central place system based on shopping movements and discussion of overlapping fields. There are implications for the city-region concept and local administration.

DELSAUT, P., (1966). "The urban hierarchy in Northern France", Hommes et terre du Nord, 1, 7-45.

Alternative measures of ranking towns in the hierarchy are presented. Empirical test of model.

DIETRICHS, B., (1966). "Central place theory", Raüforschung und Raumordnung, 24(6), 259-267.

Statement of developments in integrating central place theory into more general location theory incorporating resource-based agglomerations. Impact of advances in industrial and transportation technology would have to be included.

DOMMERMUTH, W. P., and E. W. CUNDIFF, (1967). "Shopping goods, shopping centres and selling strategies", Journal of Marketing, 31, 32-36.

DORMAN, P., (1967). "Analysing consumer markets through diffusion research", Rural Sociology, 32, 457-463.

DUTT, A. K., (1963). "Umland of Jamshedpur", Geographical Review of India, 25, (2) 84-98.

DUTT, A. K., (1966). "Daily shopping in Howrah City - a study in social geography and planning", National Geographical Journal of India, 12, 163-177.

Relationships are examined between market areas, number of customers and stalls, public transport and consumer catchment area and population in one of the twin foci of the Calcutta conurbation. Service centres are also ranked.

DUTT, A. K., (1969). "Intra-city hierarchy of central places: Calcutta as a case study", Professional Geographer, 21(1), 18-22.

EILON, S., R. P. TILLEY and T. R. FOWKES, (1969). "Analysis of a gravity demand model", Regional Studies, 3(2), 115-122.

ELIOT, HURST M. E., (1969). "The structure of movement and household travel behaviour", Urban Studies, 6(1), 70-82.

ELIOT, HURST M. E., and J. SELLERS, (1969). "An analysis of the spatial distribution of customers around two grocery retailing operations", Professional Geographer, 21(3), 184-190.

EMEQUIST, G. and L. BÄCK, (1966). "Central places in sparsely populated areas. Three examples from northernmost Sweden", Geografiska Annaler, 48B(1), 36-50.

Description of three low order central places in terms of morphology, site and situation and employment structure: at least half of the labour force is in service industry. Retail functions are spread out along major through routes.

FAIRBAIRN, K. J. and G. ROBINSON, (1967). "Towns and trend-surfaces in Gippsland Victoria", Australian Geographical Studies, 5(2), 125-134.

Trend surface analysis of towns and central place functions. At the second degree surface both regional and subregional variations are found requiring further explanation.

FARLEY, J. and L. RING, (1966). "A stochastic model of supermarket traffic flow", Operations Research, 14, 555-568.

FELDMAN, L. P., (1967). "Prediction of the spatial pattern of shopping behaviour", Journal of Retailing, 25-30.

FOLKE, S., (1967). "Central place systems and spatial interaction in Milgiris and Coorg (S. India)", Geografisk Tidsskrift, 66(7), 161-178.

Comparison of spatial interaction intensity in two differing central place systems.

FORBES, J. D., (1967). "A model of retail store structure and change: an investigation of retail trade structure in the U. S. from 1929 to 1963", unpublished Ph.D. thesis, University of California, Los Angeles.

FORREST, J., (1968). "Retail activity in New Zealand towns 1958-1963", New Zealand Geographer, 24, 1, 61-75.

FRIEDLY, P., (1965). "A note on the retail trade multiplier and residential mobility", Journal of Regional Science, 6(1), 57-63.

A study of the variability of the relationship between suburban incomes and local shopping behaviour, in relation to the generation of income through local shopping expenditures. More elastic shopping behaviour is correlated with higher family income, in turn related to shopper length of residence.

FRIEDMANN, J. and J. MILLER, (1965). "The urban field", Journal of the American Institute of Planners, 31, 312-320.

FUGITT, G. U., (1965). "The growth and decline of towns as a probability process", American Sociological Review, 30(3), 403-411.

A Markov chain process is used to simulate changes in town size and rank in Wisconsin. Transition probabilities are derived from the U. S. Census of Population 1880-1960.

FULLERTON, B., (1963). "The localisation of service industries in England and Wales", Tijdschrift voor Economische en Social Geographie, 54, 126-138.

GAMBINI, R., D. L. HUFF and G. F. JENKS, (1968). "Geometric properties of market areas", Papers and Proceedings, Regional Science Association, 20, 85-92.

The geometric properties of market areas of firms serving household consumers are examined. It is assumed that transport costs are borne by the consumer and are not readily calculable as is generally true for industrial commodity purchases. Further it is assumed that the customer is operating under conditions of uncertainty. As a result the consumer engages in an information seeking process by making choices from among alternative sources of supply in some constant proportion.

GANNON, C. A., (1969). "On the Löschian spatial curve", Regional Science Research Institute, Discussion Papers Series No. 32.

GARNER, B. J., (1966). The internal structure of retail nucleations, Northwestern University, Studies in Geography, 12, Evanston, Illinois.

Identification of a hierarchy of outlying retail centres in Chicago. Patterns of ground floor functions in different orders are explained incorporating land values and rent theory. Variations in the Chicago socio-economic space produce different hierarchial characteristics. "Reformulation" of central place theory as a more general theory of tertiary activity to take up variations in the metropolitan extensions of central place theory.

GARNER, B., (1967). "Models in urban geography and settlement location", in Chorley, R. J. and Haggett, P. (eds.), Models in Geography, London, Methuen, 303-360.

GETIS, A., (1967). "A method for the study of sequences in geography", Transactions, Institute of British Geographers, 42, 87-92.

A technique giving expected distributions of phenomena in a linear sequence, e.g. central places, service centres, establishment types in a traverse.

GETIS, A. and J. M. GETIS, (1968). "Retail store spatial affinities", Urban Studies, 5, 317-332.

GODDARD, J. B., (1970). "Functional regions within the city centre", Transactions, Institute of British Geographers, 49, 161-182.

Regionalization of the London Central Area based on origins and destinations of taxi trips. Five rotated factors of the total flow pattern reveal major subsystems based on the West End, Westminister, Covent Garden-Soho-Fleet Street, the City and Bloomsbury.

GOLLEDGE, R. G., (1967). "Conceptualizing the market decision process", Journal of Regional Science, 7(2), supplement, 239-258.

The all-knowing, infinite wisdom of Economic Man in the Christaller/ Lösch landscape is 'humanized' by viewing consumer behaviour as a learning process. Varying sizes of tributary areas are thus the manifestation of variation in 'degrees of learning' over space, giving distorted consumer trip patterns vis-à-vis the original model predictions.

GOLLEDGE, R. and L. BROWN, (1967). "Search learning and the market decision process", Geografiska Annaler, 49B 2, 116-124.

GOLLEDGE, R. G., G, RUSHTON and W.A.V. CLARK, (1966). "Some spatial characteristics of Iowa's dispersed farm population and their implications for the grouping of central place functions", Economic Geography, 43(2), 261-272.

Analysis of travel behaviour for selected commodities by the dispersed population, produces a different grouping of central place functions to an analysis of their occurrence. Space preferences and spatial 'shopping around' features are also measured.

GRUEN, M. J. and C. GRUEN, (1967). "A behavioural approach to determining optinum location for the retail firm", Land Economics, 3, 320-326.

Retail location for a consuming population in subgroups of varying spatial preferences.

GRUNEWALD, B., (1966). "On the choice of place of study", Geografiska Annaler, 48B, (1), 1-8.

HAGGETT, P. and K. GUNAWARDENA, (1964). "Determination of population thresholds for settlement functions by the Reed-Muench method", Professional Geographer, 16(4), 6-9.

HAGGETT, P., (1968). The spatial structure of city regions, Centre for Environmental Studies, Working Paper, 5.

HAMATANI, M., (1969). "Settlement pattern and functions of hamlets in Japan", Jimbun-Chiri 21, English Summary, 159.

HAMMOND, E. L. P., (1964). "Main provincial towns as commercial centres", Urban Studies, 1(2), 129-137.

HANSON, S. and D. F. MARBLE, (1969). "A preliminary typology of urban travel linkages", Research Report 57, Department of Geography, Northwestern University, Evanston, Illinois.

Multivariate analysis of numbers of stops made from one trip purpose to another (Cedar Rapids data) suggests three main types: single purpose trips for convenience goods near homeplace and for speciality goods located further away; multiple purpose trips for shopping goods and multiple purpose trips involving one or more stops at the workplace.

HARRIS, B., (1964). "A note on probability of interaction at a distance", Journal of Regional Science, 5(2), 31-35.

Modified gravity formulations based on probabilistic assumptions of spatial interaction in which the traditional drag exponent is treated as a gamma probability density function. Models are derived for behaviour over continuous space; application for interaction at discrete points "... is practically and conceptually difficult".

HART, J. F. and M. E. SALISBURY, (1965). "Population changes in Middle Western villages: a statistical approach", Annals, Association of American Geographers, 55(1), 140-160.

A study of low order central places (pop. under 1,000). Eight per cent of the variation in village population change can be explained by variations in village size and a further 16 per cent by variations in distances from larger towns and cities. Analysis of variance indicates that a more important explanatory factor may be regional disparities in the degree and rates of urbanization.

HARVEY, D. W., (1967). "Models in the evolution of spatial patterns in human geography", in CHORLEY, F. J. and HAGGETT, P., (eds.), Models in Geography, Methuen, 549-608.

Stresses the dynamics of point patterns and the processes involved in their evolution, with discussion of alternative possible distribution functions applicable to spatial series: alternative models may "explain" reality equally well.

HARVEY, D., (1968). "Pattern processes and the scale problem in geographical research", Transactions, Institute of British Geographers, 45, 71-78.

HARVEY, D., (1969). "Conceptual and measurement problems in the cognitive-behavioural approach to location theory", in COX, K. R. and GOLLEDGE, R. G. (eds.), Behavioural problems in geography, Evanston, Illinois.

HATTORI, K., (1969). "The order of areas seen from the arrangement of central places", Chirigaku-Hyoron 42, 106-122, English summary 121-122.

HAUTAMAKI, L., (1968). "Classification of centres and demarcation of spheres of influence at borough level", Fennia, 98(3), 1-50.

Hinterland delimitation by trip purpose and frequency of visit, largely following the approach of Polomäki (1964).

HAYES, C. R. and N. W. SCHULL, (1965). "Some characteristics of shopping centres", Professional Geographer, 16, 11-14.

Intraurban retail centre hierarchy based on retail turnover (Greensboro, N. Carolina). Trade area nesting is clearly illustrated and trade area size is related to pedestrian and automobile orientation.

HELLER, C. F. JR., (1969). "Variations in the trade areas of Glen Innes and Inverell N.S.W.", Australian Geographer, 11(1), 52-65.

HESS, C. F., (1966). "Geographical aspects of consumer behaviour in the retail service area of Greater Alborg", Geografisk Tidsskrift, 65(1), 1-26.

Consumer shopping behaviour is stratified by four occupational groups. Counter to central city shopping destinations are trips made to a large 'proximal' retail zone and competing 'peripheral' retail service centres.

HILL, A. D., (1967). "Spatial relations and socio-economic change: a preliminary study of differentiation of places in the Sabana de Bogota, Colombia", Professional Geographer, 18, 136-143.

HODDER, B. W., (1965a). "Distribution of markets in Yorubaland", Scottish Geographical Magazine, 81(1), 48-58.

Classification of lower order central places as periodic (2-day, 4-day, 8-day) and daily. The occurrences of the daily markets are related to the permanent settlement hierarchy: periodic markets are not related to the urban network but achieve a high level of sophistication in terms of timing and location of operations.

HODDER, B. W., (1965b). "Origins of traditional markets south of the Sahara", Transactions of the Institute of British Geographers, 36, 97-106.

HODGE, G., (1966). "Do villages grow?", Rural Sociology, 31, 131-136.

HODGE, G., (1967). "The prediction of trade center viability in the Great Plains", Papers and Proceedings, Regional Science Association, 15, 87-115.

Identification of a central place hierarchy in Saskatchewan; linear characteristics of market areas. Factor analysis of 'community environment' of 473 centres reveals dimensions of 'urban size', 'farm size' and 'urban density' accounting for 60 per cent of the variance of 35 original ranked variables. Multiple regression of factor scores on derived variables.

HODGE, G., (1968). "Urban structure and regional development", Papers and Proceedings, Regional Science Association, 20-21, 101-123.

HOOVER, E. M., (1969). "Determinants of the size of central place trade areas", paper read at the Annual Conference, Regional Science Association, San Francisco, mimeo.

HORTON, F., (1967). "Utility of trip forecasting models based on disaggregated models", Professional Geographer, 19, 319-322.

HORTON, F. E., (1968). "Location factors as determinants of consumer attraction to retail firms", Annals, Association of American Geographers, 58, 787-807.

Spatial variability in consumer attraction to retail firms may be considered a function of the location of the individual retail establishments. A statistical analysis of spatial relationships of important locational considerations was conducted in the city of Waco, Texas. The results of the analysis indicate that location of competition and investment factors are extremely important considerations when attempting to explain differences in the number of consumers attracted to retail firms.

HUDSON, J. C., (1967a). "An algebraic relation between the Lösch and Christaller central place networks", Professional Geographer, 19(3), 133-135.

Spells out the relationship by factoring the numbers of central places in the Löschian landscape into their prime components to correspond with unique interpretation in the Christaller net (-extended in Dacey and Sen, 1968).

HUDSON, J. C., (1967b). "Theoretical settlement geography", Unpublished Ph.D. thesis, University of Iowa.

HUDSON, J. C., (1969a). "A location theory for rural settlement", Annals, Association of American Geographers, 59, 365-381.

A theory of rural settlement location is proposed which will explain changes in settlement distribution over time. A series of spatial processes similar to those found in plant ecology studies are postulated for rural settlement: colonization, by which the occupied territory of a population expands; spread, through which settlement density tends to increase with a tendency to short distance dispersal; and competition, the process which produces a regularity in settlement pattern when rural dwellers are found in sufficient numbers to compete for space. Empirical investigations over a 90 year period (1870-1960) in 6 Iowa counties reveals that the expected increase in regularity does occur. These effects are measured by fitting the Poisson, negative binomial, and regular Poisson distributions to quadrat censuses of the settlement maps. Variance-mean ratios declined over time with changes in the farm economy requiring fewer but larger farms.

HUDSON, J. C., (1969b). "Diffusion in a central place system", Geographical Analysis, 1(1), 45-58.

HUDSON, J. C., (1969c). "A model of spatial relations", Geographical Analysis, 1(3), 260-271.

HUFF, D. L., (1966). "A programmed solution for approximating an optimum retail location", Land Economics, 42(3), 293-303.

Presentation of a gravity/potential model aimed at maximizing potential sales.

HUFF, D. L. and L. BLUE, (1966). A programmed solution for estimating retail sales potentials, Center for Regional Studies, Kansas.

HUFF, D. L. and G. F. JENKS, (1968). "A graphic interpretation of distance in gravity models", Annals, Association of American Geographers, 58, 814-824.

The portrayal of complex surfaces stemming from the gravity model in 3-D format can greatly facilitate an understanding of spatial behaviour. Not only can the geometric properties of the gravity model be understood more readily, but such a portrayal is extremely valuable in the conduct of actual experiments.

HUTTON, C. L., (1967). "Use of floor spaces in the functional differentiation of small towns", Geographical Bulletin, 9(3), 272-283.

ILLERIS, S., P. KONGSTAD and E. LARSEN, (1966). "Central places in a tutland region and central place theory", Geografisk Tidsskrift, 65(1), 27-47.

Three ranks of settlement are determined by occurrence of central functions and nesting features are illustrated. A restatement of the Christaller/Lösch framework and recent developments and extensions are summarized.

ILLERIS, S. and P. O. PEDERSEN, (1968). "Central places and functional regions in Denmark: factor analysis of telephone traffic", Geografisk Tidsskrift, 67(1), 1-18.

JANELLE, D. G., (1969). "Spatial reorganization: a model and concept", Annals, Association of American Geographers, 59, 348-364.

Travel-time connectivity is a fey factor in defining a process of the spatial reorganization of man's functional establishments. A case study relating highway development with the growth in wholesale activity for selected cities in the upper Midwest of the U. S. indicates that, aside from being a good surrogate of transport efficiency travel time, connectivity is also a good measure of the relative advantage of a given place in attracting to itself the centralism and specialization of human activity.

JOHNSSON, B., (1968). "Utilizing telegrams for describing contact patterns and spatial interactions", Geografiska Annaler, 50B, No. 1, 48-51.

JOHNSTON, R. J., (1966a). "Central places and the settlement pattern", Annals, Association of American Geographers, 56(3), 541-549.

Evidence is found for an aspatial hierarchy of settlement in rural Yorkshire, England but hierarchical spatial relationships are lacking.

JOHNSTON, R. J., (1966b). "An index of accessibility and its use in the study of business services and settlement patterns", Tijdschrift voor Economische en Sociale Geographie, 57, (1), 33-38.

Indices of accessibility using business services are suggested and variations in urban dominance are discussed. General correlation between business service and traffic, rural population and settlement pattern.

JOHNSTON, R. J., (1968). "Railways, urban growth and central place patterns", Tijdschrift voor Economische en Sociale Geographie, 59(1), 33-41.

Taking the Melbourne area as a case study two assumptions of classical central place theory are tested: (1) equal accessibility of central place to all points; (2) normative behaviour of consumers. It was found that (a) all large central places in surburan areas will be located close to stations, and (b) the pattern of central places will be determined by spacing of stations and dates at which they were opened.

JOHNSTON, R. J. and P. J. RIMMER, (1967a). The competitive position of a planned shopping centre", Australian Geographer, 10(3), 160-168.

Customer-origin data for a Melbourne suburban shopping centre does not support central place theory predicted size of trade area.

JOHNSTON, R. J. and P. J. RIMMER, (1967b). "A note on consumer behaviour in an urban hierarchy", Journal of Regional Science, 7(2), 161-166.

Two hypotheses are tested, namely (1) residents of individual towns shop through the hierarchy of centres above the level of their home town, and (2) frequency with which people visit a higher level centre decreases with increasing distance because of increasing transport costs. The first hypothesis is rejected and the second confirmed only for lower

JONES, R., (1967). "Central place theory and the hierarchy and the location of shopping centres in a city: Edinburgh", mimeo., Institute of British Geographers Durham Conference.

Identification of service centre hierarchy and discussion of the spatial distributions of centres and population in towns and their evolution.

KAR, N., (1962). "Urban hierarchy and central functions around Calcutta and their significance", Lund Studies in Geography, Series B, 24, 253-269.

KAR, N., (1963). "Economic character of the metropolitan sphere of influence of Calcutta", Geographical Review of India, 25(2), 108-137.

KENYON, J., (1967). "On the relationship between central function and size of a place", Annals, Association of American Geographers, 57, 736-750.

The relationships between central place size and function of characteristics are investigated for a study area in Georgia. Findings indicate that discrete mixes of activities characterize places in different size categories.

KING, L., (1966). "Cross-sectional analysis of Canadian urban dimensions: 1951 and 1961", Canadian Geographer, 10, 205-224.

KING, L., (1967). "Discriminant analyses of urban growth in Ontario and Quebec 1951-1961", Annals, Association of American Geographers, 566-578.

KING, L., E. CASETTI and D. JEFFREY, (1969). "Economic impulses in a regional system of cities: a study of spatial interaction", Regional Studies, 3, (2), 213-218.

KURESNY, K. V., (1966). "Urbanisation in Pakistan in relation to aridity", Pakistan Geographical Review, 21, (2), 1-13.

Comparison of theoretical town-size frequencies with observed frequencies in Pakistan gives a poor fit, and the differences are tested for significance (chi-square). Suggested reasons for the lack of an integrated national central place system in Pakistan are the agrarian basis of urbanisation, land infertility and aridity.

LACHENE, R., (1965). "Networks and the location of economic activities", Papers and Proceedings, Regional Science Association, 14, 183-196.

An attempt is made to identify the relationships between the overall rate of growth of a territory, the locational dimension of that growth and the transport network. The integration of the capacity of the network into the conventional concept of potential, and the use of concept as the basis of a dynamic law governing the development of each town within the network's territory, provide such a series of relationships.

LAKSHMANAN, T. R. and W. G. HANSEN, (1965). "A retail market potential model", Journal, American Institute of Planners, 31(2), 134-143.

Gravity/potential formulation of shopping trips to urban centres developed in the metropolitan plan for the Baltimore region.

LAULAJAMEN, R., (1967). "On the classification of centres with regard to the retail trade on the low and medium hierarchical levels in Southeast Höme, Finland", Helsinki School of Economics, Helsinki.

Application of the central place model to Finland, involving selection of centrality index, delimitation of fields and identification of hierarchy.

LAULAJAMEN, R., (1968). Store size and the central place hierarchy, The Helsinki School of Economics, Series C:II:3.

LINSKY, A. S., (1965). "Some generalisations concerning primate cities", Annals, Association of American Geographers, 55, 506-513.

LOMAS, G., (1964). 'Retail trading centres in the Midlands", Journal, Town Planning Institute, 50, 104-119.

LUKERMANN, F., (1966). "Empirical expressions of nodality and hierarchy in a circulation manifold", East Lakes Geographer, 17-44.

MACKA, M., (1967). "Delimiting nodal regions from the point of view of commuting", in MIROSLAV MACKA (ed.) Economic Regionalisation, Prague, Academia, 181-186.

Different commuting patterns are found depending on length of central place industrial development, and do not reflect 'centrality' of the central place.

MANCHESTER, UNIVERSITY OF, (1964). Regional shopping centres in N.W. England, Department of Town and Country Planning.

The "Haydock Report". Indicative functions are used to establish rank order relations and implications for the central place system of introducing a planned town shopping centre are analyzed for alternative locations.

MARBLE, D. F., (1964). 'Simple Markovian model of trip structure in a metropolitan region", mimeo., Western Section Meetings, Regional Science Association.

MARBLE, D. F., (1967). "A theoretical exploration of individual travel behaviour", in: W. L. GARRISON and D. F. MARBLE, Quantitative Geography I, Northwestern University Studies in Geography, 13, 33-53.

A game theoretic framework is suggested in which length of trip and trip ends are conditioned by a simple decision matrix to optimize payoff for particular trip purposes.

MARBLE, D. F. and S. R. BOWLBY, (1968). "Shopping alternatives and recurrent travel patterns", in HORTON, F. (ed.), Geographic studies of urban transportation and network analysis, Northwestern University, Studies in Geography, No. 16, 42-75.

A discussion of the concept of opportunity sets and choice spaces for consumers precedes a study of recurrent consumer trip patterns for different classes of commodities, (Cedar Rapids data set).

MARK, H. and K. P. SCHWIRAN, (1967). Ecological position, urban central place function and community population", American Journal Sociology, 73(1), 30-41.

Community population growth as a function of central place role in a rural area with improving transportation. Growth producing factor varies according to ecological situations as related to various expansions of the economic base.

MARSHALL, J. U., (1964). "Model and reality in central place studies", Professional Geographer, 16, No. 1, 5-8.

MARSHALL, J. U., (1969). The location of service centres, University of Toronto, Department of Geography, Research Publications 3.

A set of seven criteria is suggested for the characterization of the features of hierarchical structure in central place systems. The criteria are applied to empirical analyses of the Barrie and Owen Sound systems (Ontario).

MAYFIELD, R. C., (1967). "A central place hierarchy in Northern India", in: GARRISON, W. L. and MARBLE, D. F. (eds.), Quantitative Geography I, Northwestern University, Studies in Geography, 13, 120-166.

Classification of 129 central place functions in Indian towns and villages by cluster analysis. Near neighbour relationships between central places measure spatial structure of the central place system.

MEDVEDKOV, Yu V., (1967a). "Concept of entropy in settlement pattern analysis" Papers and Proceedings, Regional Science Association, 18, 165-168.

Development of a method for calculating the ratio of random and uniform components of a point pattern. Applied to the S.W. Wisconsin scene, the method supports (marginally) Brush's original contention of a uniform settlement pattern (G.R. 1953).

MEDVEDKOV, Yu V., (1967b). "The regular component in settlement patterns as shown on a map", Soviet Geography: Review and Translation, 8(3), 150-168.

The frequency of central places per cell is calculated from a map and compared to expected, random, uniform and agglomerated patterns. Entropy is interpreted as the deviation from a Christaller hexagonal pattern.

MEDVEDKOV, Yu V., (1967c). "Application of mathematics to population geography", Soviet Geography: Review and Translation, 8(9), 709-722.

Suggests a deductive model for optimal retail location based on pedestrian shopping flows in the workplace - residence trip.

MEDVEDKOV, Yu V., (1968). "An application of topology in central place analysis", Papers and Proceedings, Regional Science Association, 20, 77-84.

An attempt is made to investigate the fundamental spatial regularity of urban systems. This paper presents a graph theory approach to the spatial analysis of central place patterns, focussing on the non-metrics of urban networks. Analytical methods directly applicable to all network types are presented in order to reveal the extent of randomness and regularity in network structures. This is a more general approach than the nearest neighbour technique or the separation of entropy in a developed settlement pattern into its regular and random components.

MITCHELL, L., (1968). "An evaluation of central place theory", Southeastern Geographer, 8, 46-53.

MOORE, C. T., (1966). "Consumer travel behaviour: a spatial analysis", The Southern Journal of Business, 150-159.

MURDIE, R., (1965). "Cultural differences in consumer travel", Economic Geography, 211-233.

Differences in travel behaviour for two sets of consumers, 'modern' Canadians and Old Order Mennonites are investigated for an area of South Ontario. Significant differences in travel patterns for some goods were shown to exist. However a multiple regression model which tried to explain variation in distances travelled was only of moderately high predictive power.

MYCIELSKI, J. and W. TRZECIAKOWSKI, (1963). "Optimization of the size and location of service stations", Journal of Regional Science, 5(1), 59-68.

A model for the optimization of the size and location of road side service stations along a given route and over a given area.

McEVOY, D., (1968). "Alternative methods of ranking shopping centres", Tijdschrift voor Economische en Sociale Geographie, 211-217.

Four methods for ranking service centres are compared by applying them to the same set of centres in the Manchester conurbation, England.

McINTIRE, E. G., (1967). "Central places on the Navajo Reservation: a special case", Yearbook, Association of Pacific Coast Geographers, 29, 91-96.

NADER, G. A., (1969). "Socio economic status and consumer behaviour", Urban Studies, 6(2), 235-245.

NIEDERCORN, J. H. and B. V. BECHDOLT, (1969). "An economic derivation of the 'gravity law' of spatial interaction", Journal of Regional Science, 9(2), 273-282.

NISHIMURA, M., (1969). "Construction of areas of central places", Jimbun-Chiri, 21, English summary, 247-248.

NYSTUEN, J. D., (1967). "A theory and simulation of intraurban travel", in: GARRISON, W. L. and MARBLE, D. F. (eds.), Quantitative Geography I, Northwestern University, Studies in Geography, 13, 54-83.

Impact on shopping trip patterns of multipurpose trips and retail clusters of varying composition.

O'FARRELL, P., (1965). "The urban hinterlands of New Ross and Enniscorthy", Irish Geography, 5(2), 67-78.

O'FARRELL, P., (1968). "Multivariate analysis of the spacing of central places in County Tipperary", Irish Geography, 5(5), 428-439.

OLSSON, G., (1964). "The spacing of central places in Sweden", Papers and Proceedings, Regional Science Association, 12, 87-93.

An absolute measure of centrality is based on sales of durables. Spatial relationships are examined as distances to nearest neighbour of same order (see Thomas, E. N., G. R. 1961).

OLSSON, G., (1965a). Distance and human interaction: a review and bibliography, Regional Science Research Institute, Bibliography Series, No. 2, 112 pp.

OLSSON, G., (1965b). "Distance and human interaction: a migration study", Geografiska Annaler, 47B, (1), 3-43.

An attempt to link migration studies with central place theory through two migration models: (1) a stochastic framework related to near neighbour distances and (2) a deterministic framework based on least effort principles. Social gravity models are formulated to predict migration intensities in relation to different levels of a central place hierarchy.

OLSSON, G., (1966). "Central place system, spatial interaction and stochastic processes", Papers and Proceedings, Regional Science Association, 18, 13-45.

Relationships between central place theory and a 'more general theory of spatial interaction', summarizing developments of theoretical statements and extensions of the central place model. Includes the Curry (1964) and Berry (1964) conclusion concerning maximum entropy and rank size relationships. Ends with a statement of the advantages of simulation techniques for the development of dynamic and behavioural (probabilistic) models of settlement distribution.

OLSSON, G., (1969a). "Trends in spatial model building: An overview", Geographical Analysis, 1, (3), 219-224.

OLSSON, G., (1969b). "Inference problems in locational analysis", in COX, K. and GOLLEDGE, R. G., Problems of Spatial Behaviour.

OLSSON, G. and S. GALE, (1968). "Spatial theory and human behavior", Papers and Proceedings, Regional Science Association, 21, 229-242.

PALOMACKI, M., (1965). "A method for grouping the central functions", Proceedings Scandinavian-Polish Regional Science Seminar, Warsaw (pub. 1967), 215-225.

Centrality measured by points (compare 'functional unit' in Berry, Barnum and Tennant, Papers and Proceedings, Regional Science Association, 1962). Identification of hierarchy and trade areas in S. Bothnia.

PAPAGEORGIOU, G. J., (1969). "Description of a basis necessary to the analysis of spatial systems", Geographical Analysis, 1(2), 213-215.

PARKER, H., (1962). "Suburban shopping facilities in Liverpool", Town Planning Review, 33, 197-223.

PARR, J. B., (1969). "City hierarchies and the distribution of city size: a reconsideration of Beckmann's contribution", Journal of Regional Science, 9(2), 239-253.

POCOCK, D.C.D., (1966). "Specialized industrial towns as service centres: a comparison of Scunthorpe and Corby", Transactions, Institute of British Geographers, 40, 97-109.

Scunthorpe's hinterland is more 'mature' than that of younger Corby. Also, it is suggested that the development of Corby's central place role is likely to be restrained by the proximity of well-established centres.

POCOCK, D.C.D., (1968). "Shopping patterns in Dundee: Some observations", Scottish Geographical Magazine, 84, 108-116.

PRYOR, R. J., (1968). "Accesibility in Melbourne's urban fringe", Research Paper No. 14, Department of Geography, University of Sydney.

Discussion of distance friction on movement for residents in "outer suburbs" and the "urban fringe" in Melbourne.

RAY, D. M., (1967). "Cultural differences in consumer travel behaviour in eastern Ontario", Canadian Geographer, 11(3), 143-156.

Comparison of travel behaviour of French and English Canadians and of central place systems in bi-cultural eastern Canada with S. Dakota, S.W. Iowa and Chicago. Lowest and highest order shopping trips are most similar: intermediate range goods and services (e.g. medical-legal) show greatest differences between the two cultural groups.

RAY, D. M. and R. A. MURDIE, (1968). "Socio-economic dimensions and spatial structure of Canadian cities", mimeo., Waterloo.

REYNOLDS, J., (1963). "Shopping in the northwest", Town Planning Review, 34, 213-236.

RHODES, T. and R. WHITAKER, (1967a). "Forecasting shopping demand", Journal, Town Planning Institute, 53(5), 188-192.

Use of the gravity/potential model to estimate future shopping patterns in part of S.E. London. Discussion of trading performance and capacity in relation to present and projected retail floor space.

RHODES, T. and R. WHITAKER, (1967b). "A further note on forecasting shopping demand", Journal, Town Planning Institute, 53(9), 415-416.

Reply to Andrews (1967).

RIMMER, P. J. and R. J. JOHNSTON, (1967). "Areas of community interest in Victoria as indicated by competitive sport", Australian Geographer, 10(4), 311-313.

Distribution of football clubs as central place functions. Hierarchy of league clubs conforms to the rank size profile of population centres.

RODER, W., (1969). "The genesis of the central place system - a Rhodesian example", Professional Geographer, 21(5), 16-19.

ROGERS, A., (1965). "A stochastic analysis of the spatial clustering of retail establishments", Journal, American Statistical Association, 60, 1094-1103.

ROSING, K. E., (1966). "A rejection of the Zipf model (rank size rule) in relation to city size", Professional Geographer, 18(2), 75-82.

Questions the theoretical basis for applying the rank size rule to city size variations and uses chi-square to test the goodness of fit of the Zipf model to the five largest cities in 132 countries. In all cases, the Zipf model is an inadequate description.

RUSHTON, G., (1966). Spatial patterns of grocery purchases by the Iowa rural population, University of Iowa, Studies in Business and Economics, New Series No. 9.

An attempt to determine central place relationships through study of individual shopping trips. Behavioural factors influencing spatial shopping patterns are examined and tested for significance. Future research areas are indicated.

RUSHTON, G., (1969a). "Analysis of spatial behavior by revealed space preference", Annals, Association of American Geographers, 391-400.

In the study of spatial behaviour we are interested in finding the rules for spatial choice which when applied to any unique distribution of spatial opportunities are capable of generating spatial behaviour patterns similar to those observed. Behavioural postulates in geographical theories should incorporate these rules rather than descriptive statistics of actual behaviour in a spatial system, since the latter are incorporating knowledge of the same spatial system, that the theory hopes to generate, and in so doing, to explain. The concept of revealed space preferences is proposed as the organizing concept for finding these rules.

RUSHTON, G., (1969b). "The scaling of locational preferences", in COX, K., and GOLLEDGE, R. G. (eds.), Problems of behavioural geography, Northwestern University, Studies in Geography, 17, 197-227.

RUSHTON, G., R. GOLLEDGE, W. CLARK, (1967). "Formulation and test of a normative model for the spatial allocation of grocery expenditures by a dispersal population", Annals, Association of American Geographers, 57, 389-400.

An attempt is made to formulate an alternative model of consumer travel behaviour to those put forward by Berry (et al.) and Murdie (1965).

RUSSWURM, L., (1964). "C.B.D. retail sales mix 1948/1958", Annals, Association of American Geographers, 54, 524-536.

RYDELL, C. P., (1967). "A note on a location principle: between the median and the mode", Journal of Regional Science, 7(2), 185-191.

A refinement of the 'median location' principle for physical distribution to account for non-linear transportation costs in delivery, and implicitly, for a skewed population distribution over the linear region. The constraint of uniform, individual consumer demand functions is maintained and the same 'median-mode' location applies for spatial price discrimination behaviour by the producer/distributor.

SAXENA, N. P., (1967). "Occupational structure, population size and central place considerations regarding urban centres in India", The Geographical Observer, 3, 1-14.

Four classes of central places based on employment structure and an analysis of central places at different levels of the hierarchy in terms of this classification. Four levels are recognized and their national distribution identified.

SCHMOUK, G. and HAESEN F. VAN DER., (1967). "The hierarchy of urban centres in northwest Belgium and their spheres of influence", Bull. de Belge d'Etudes Géographiques, 36(1), 79-171.

Alternative methods of delimiting urban fields and discussion of extent of distortion, e.g., Ghent's region is usurped to the northeast by Antwerp and to the southeast by Brussels to the extent of 190,000 and 340,000 people respectively.

SCHULL, N. W. and C. R. HAYES, (1965). "Spatial aspects of the retail core: the case of Greensboro, N.C.", Southeastern Geographer, 5, 1-74.

Random, uniform and clustered distributions are examined for various types of central place functions. Shopping trips within the system are discussed in relation to trade areas.

SCOTT, P., (1964). "Areal variations in the class structure of the central place hierarchy", Australian Geographical Studies, 2, (2), 73-86.

SCOTT, P., (1968). "Trade-center population change, centralization and trade-area farming type", Rural Sociology, 33(4), 424-436.

An examination of population changes in small farming settlements (Tasmania). Different patterns of centralization vary with functional status of higher and central places, and with organization of the local agricultural economy.

SIMMONS, J. W., (1966). Toronto s changing retail complex: a study in growth and blight, University of Chicago, Department of Geography, Research Papers, 104.

Concepts derived from earlier work in Chicago are used to describe the commercial structure of Toronto and to identify blight'.

SIMMONS, J. W., (1968). Flows in an urban area: a synthesis, Centre for Urban and Community Studies, Research Papers Series, No. 6, Toronto.

SINGH, K. M., (1966). "Spatial pattern of central places in the middle Ganga valley, India", National Geographical Journal of India, 12, 218-226.

A centrality index is suggested and five orders of central place are defined. Although clear differences in population size and functional range exist between the study area and Wisconsin and S. England, significant parallelisms in terms of lower level spatial patterns are revealed in the Indian and western areas.

SINGH, S. M., (1965). "The stability theory of rural central place development", National Geographical Journal of India, 11(1), 13-21.

Four stages in the evolution of rural low order central places (bazaars) are worked out in a part of the Ganga-Ghaghara Doabs. 'Stability' characterizes the fourth stage where trade area is constant, building are permanent and non-perishable goods dominate the commodity structure.

SINGH, K., (1968). "Territorial basis of medieval town and village settlement in Eastern U.P. India", Annals, Association of American Geographers, 58, 203-220.

SMAILES, A. J., (1969). "Some aspects of the South Australian urban system", Australian Geographer, 11(1), 29-51.

SMITH, J., (1965). "The growth of central places as a function of regional economy and population", Swedish Journal of Economics, 67(4), 279-307.

Examination of the role of the central place network in regional population and transport growth. Growth of central place transport can be expressed approximately as the anticipation of growth, proportional to the present volume of regional transport, plus additional demand from the increase of regional population and economic expansion.

SMITH, R.D.P., (1968). "The changing urban hierarchy", Regional Studies, 2(1), 1-19.

A comparison of 1965 ranking of English central places with Smailes' investigation (1944). Principle conclusions: 'general stability and more gains than losses of status'. Gains are concentrated in the Home Counties and Lancashire, losses in the E. Pennines.

SPARICIO, F., (1966). "Trading area variations for different goods sold in the same store", Professional Geographer, 18(1), 5-8.

STERNSTEIN, L., (1966). "Contemplating a hierarchy of centres in Thailand", Pacific Viewpoint, 7(2), 229-235.

Identification of the central place net in Thailand. Despite changes in population size and urban form the functional range and spatial structure have remained essentially the same since early twentieth century.

STIGLBAUER, K., (1966). "Some problems of central places at the lowest level in Austria", Papers and Proceedings, Regional Science Association, 18, 47-65.

Identification of the characteristics of low order central places and structural changes occurring within the pattern: regional concentration, concentration of tertiary (and secondary) activities, reduction in levels of service.

STONE, E., (1963). "Traffic generated by a Wilmslow specialty store", Town Planning Review, 34(2), 119-145.

STUAN, J., (1967). "An experimental model of a system of central towns and cities: Czechoslovakia", Ekistics, 23(136), 145-149.

Three grades of central places are defined in a national economic plan of urban development and alternative central place system forms are discussed.

SUENTO, I., (1965). "A comparison between central places and their fields in Finland", Fennia, 92(2), 1-34.

Classification of 54 central places by number of retail and service facilities in each place. Gravity model delimitation of urban fields. A significant correlation is found between centrality and central place population, central place plus field population, and agricultural acreage in the field. No significant correlation is found between centrality and areal extent of field due mainly to differential economic development and population density between southwest and northeast Finland.

SUND, L., (1966). "The theoretical estimation of centrality: examples from southern Sweden", Sevensk Geografisk Arsbok, 42.

SWEET, F. H., (1964). "An error parameter for the Reilly-Converse law of retail gravitation", Journal of Regional Science, 5(2), 69-72.

The 'error' derives from the application of the gravitational formula to towns as points, rather than as communities of areal extent.

TARRANT, J. R., (1967a). "Retail distribution in eastern Yorkshire in relation to central place theory - a methodological study", University of Hull, Occasional papers in Geography, 8.

Methodology in central place studies and an analysis of shopping trips by frequency, mode and occupation. Identification of central place hierarchy based on "maximum probable distance" travelled for specific goods.

TARRANT, J. R., (1967b). "A classification of shop types", Professional Geographer, 19(4), 179-183.

Taxonomic problems and procedures in deriving central place hierarchies based on characteristic of retail establishments (in the East Riding of Yorkshire, England).

TARRANT, J. R., (1968). "A note concerning the delinition of groups of settlements for a central place hierarchy", Economic Geography, 144-152.

A technique for revealing groups in a set of values is applied to data relating to the central place system of Holdenness (Yorks.) and as a result a hierarchy of centres is defined.

TEITZ, M. B., (1968a). "Locational strategies for competitive systems", Journal of Regional Science, 8(2), 135-148.

TEITZ, M. B., (1968b). "Toward a theory of urban public facility location", Papers and Proceedings, Regional Science Association, 21, 35-52.

THOMAS, E. N., (1967a). "Additional comments on population size relationships for sets of cities", in: GARRISON, W. L. and MARBLE, D. F., (eds.), Quantitative Geography I, Northwestern University, Studies in Geography, 13, 167-191.

Development of lognormal and log-lognormal frequency distributions of city sizes, according to assumptions concerning population size and distribution and characteristics of population growth.

THOMAS, E. N., (1967b). "What sprawl has done to central place theory", in GOTTMAN, J. and HARPER, R. A., Metropolis on the move, N.Y., Wiley, 36-42

Difficulty of applying original central place model to intra-metropolitan areas: required "... and attempt to examine a more basic spatial interaction model that involves two points, rather than a point and an area which has been the concern of central place theory to date".

THOMPSON, D. L., (1966). "Future directions in retail area research", Economic Geography, 42(1), 1-18.

Historical account of concepts and methodology in retail trade area analysis for both inter- and intra-urban environments.

THORPE, D., (1967). "The study of shops and shoppers: a consideration of the central place system approach", mimeo., Institute of British Geographers Durham Conference.

Discussion of central place theory in terms of retail distribution patterns. The major issues of central place studies are size and status of centres, nested hierarchies functional range, demand and supply of goods. Non-issues are (or should be) centralizing and other location forces, centres and ribbons, geometric regularities and alternative taxonomic methods.

THORPE, D., (1968). "The main shopping centres of Great Britain in 1961: their locational and structural characteristics", Urban Studies, 5(2), 165-206.

THORPE, D., and G. A. NADER, (1967). "Customer movement and shopping centre structure: a study of a central place system in N. Durham", Regional Studies, 1(2), 173-191.

Levels and spatial profiles on consumer orientation to different types and orders of shopping centres; structure of overlapping market areas; thresholds for different order goods.

THORPE, D. and T. C. RHODES, (1966). "The shopping centres of the Tynside urban region and large scale grocery retailing", Economic Geography, 42(1), 53-73.

A centrality index is applied and 345 centres in the conurbation are formed into a 'stepped continuum'. Four grades are determined and their spatial configuration compared to expected central place theory patterns.

TIEDEMANN, C. E., (1968). "The classification of cities into equal size categories", Annals, Assocation of American Geographers, 58, 775-786.

Acceptance of the notion that population is a measurable surrogate for city complexity for many central place studies. In doing this, however, the researcher is at once confronted with the problem of classifying settlements into equal size categories. The method proposed by Thomas to expand the central place model is discussed in detail and applied to those cities and towns in Michigan having populations of more than 1000.

TIETZ, B., (1965). "Zum Standort des Einzelhandels", Raumforschung und Raumordnung, 23(1), 1-18.

A study of retail structure in the Saarland and identification of a hierarchy of shopping centres. No concentration of retail trading into fewer locations was detected between 1951-1960. High correlation found between percentage population change and change in per capita turnover.

TINBERGEN, J., (1968). "The hierarchy model of the size distribution of centres", Papers and Proceedings, Regional Science Association, 20, 65-68.

TORNQVIST, G., (1968). "Flows of information and the location of economic activities", Geografiska Annaler, 40B, 99-107.

ULADIMIROV, U. V., (et al.), (1967). "Some aspects of the formation of urban settlement patterns", Soviet Geography, Review and Translation, 8(2), 58-70.

Classification of central place systems as an approach to planning for urban growth in different types of development areas.

VAPNARSKY, C. A., (1969). "On rank size distributions of cities: an ecological approach", Economic Development and Cultural Change, 17, 4, 584-595.

VINING, R., (1964). "An outline of a stochastic model for the study of the spatial structure and development of a human population system", Papers and Proceedings, Regional Science Association, 13, 15-40.

A statement of a model for the distribution of central places, resources and performance of an economic system. The possibility of building in normative constraints induces the probabilistic framework.

VUORISTO, K., (1967). "Highway-oriented service establishments on Route 5, Finland", Fennia, 97(8).

WEBB, J. W., (1959). "Basic concepts in the analysis of small urban centres of Minnesota", Annals, Association of American Geographers, 49, 55-74.

WEBBER, M. J., (1969). "Sub-optimal behaviour and the concept of maximum profits in location theory", Australian Geographical Society, 7(1), 1-8.

WEIGAND, K., (1966a). "Town and surround relationships and service area of the border town of Flensburg and other central places in the northern parts of Schlesweig", Schriften des Geographischen Instituts der Universität Kiel, 25, 18-34.

Characteristics of the Flensburg central place system before and after frontier changes altered its relative location from being central to the province to being peripheral.

WEIGAND, K., (1966b). "Flensburg as a central place in traffic across the border", Schriften des Geographischen Instituts der Universität Kiel, 26, 135-200.

A study of interaction between Flensburg (Schlesweig) and its field, including part of Denmark, in terms of seasonal tourist traffic, weekend traffic and shopping traffic.

WHEBELL, C. F. J., (1969). "Corridors: a theory of urban systems", Annals, Association of American Geographers, 59, 1-26.

WILSON, A. G., (1967). "A statistical theory of spatial distribution models", Transportation Research, 1(3), 253-269.

WILSON, A. G., (1969). "The use of entropy maximising models", Journal of Transport Economics and Policy, 3(1), 15-31.

WOLDENBERG, M. J., (1968). "Energy flow and spatial order: mixed hexagonal hierarchies of central places", Geographical Review, 552-574.

Concepts of general systems and central place geometry are fused so that it is possible to "explain a wide variety of data from S. Germany, Finland, Ghana, Nigeria, Australia and Wales".

WOOLMINGTON, E. R., (1965). "Metropolitan gravitation in New South Wales", Australian Geographer, 9(6), 359-376.

The boundary between the fields of Sydney and Brisbane is estimated at the Reilly model. Empirical observation of passenger rail movements and newspaper circulation provides Sydney with a larger field than expected. The distortion appears to be a function of the location of the State boundary, which affects the organization of the inter-state railway system.

YUILL, R. S., (1967). "Spatial behaviour of retail customers, some empirical measurements", Geografiska Annaler, 49B, 2, 105-115.

ZAIDI, I., (1968). "Measuring the locational complementarity of central places in Western Pakistan", Economic Geography, 218-239.

CATEGORIZATION

I. STUDIES OF THE SPATIAL STRUCTURE OF TERTIARY ACTIVITY SYSTEMS

a) inter-urban

b) intra-urban

II. STUDIES OF SPATIAL INTERACTION AND BEHAVIOUR IN TERTIARY ACTIVITY SYSTEMS

a) inter-urban

b) intra-urban

III. STUDIES OF SYSTEM CHANGE

a) inter-urban

b) intra-urban

IV. APPLICATIONS FOR PLANNING AND PLANNED SYSTEMS

a) mainly inter-urban

b) mainly intra-urban

V. THEORETICAL EXTENSIONS

a) formalization of spatial organization and spatial relations

b) probabilistic bases for spatial organization and spatial relations

i) probabilistic interpretation of spatial structure

ii) probabilistic interpretations of spatial interaction

c) links to spatial economic theory

d) links to psycho-social studies

I. STUDIES OF THE SPATIAL STRUCTURE OF TERTIARY ACTIVITY SYSTEMS

a) inter-urban tertiary activity systems

Abiodun (1967, 1968); Ahmad (1965, 1967a,b); Andrews (1970); Barnum (1966); Berry (1966, 1967a); Birch (1967); Bobek (1967); Boudeville (1963); Brunn (1967); Bylund (1965); Carruthers (1967a,b); Carter (1968); Carter and Davies (1963); Chaterjee (1965); Christaller (1964); Clark (1967); Clawson (1966); Daly and Brown (1965); Davies, R. J. (1967); Davies, R. L. (1969b); Davies, W. K. (1965, 1967, 1968); Davies and Robinson (1967); Dutt (1963);

Forbes (1967); Forest (1968); Friedmann and Miller (1965); Fullerton (1963); Garner (1967); Grunewald (1966); Haggett (1968); Hammatami (1969); Hammond (1964); Hart and Salisbury (1965); Hattori (1969); Heller (1969); Hodder (1965a,b); Hodge (1967); Illeris et al. (1966); Johnson (1966a); Kenyon (1967); King (1966, 1967); Kuresny (1966); Linsky (1965); Lomas (1964); Manchester University (1964); Mark and Schwiran (1967); Marshall (1969); Mayfield (1967); McIntire (1967); O'Farrell (1968); Olsson (1964); Palomaki (1965); Parr (1969); Pocock (1966); Ray and Murdie (1968); Rosing (1966); Russworm (1966); Saxena (1967); Scott (1964); Singh K. M. (1966); Singh K. (1968); Smailes (1969); Smith J. (1965); Smith R.D.P. (1968); Sternstein (1966); Stiglbauer (1966); Suento (1965); Tarrant (1967a); Thorpe (1958); Vuoristo (1967); Webb (1959); Whebell (1969); Weigand (1966a,b); Zaidi (1968).

b) intra-urban tertiary activity systems

Ambrose (1968); Ameen and Erlandsson (1968); Andrews (1970); Applebaum (1966); Bengtsson (1964); Blount (1964); Boal and Johnson (1965a); Bowlby (1969); Boyce and Clark (1963); Buissinck (1967); Carol (1969); Carruthers (1962); Cohen and Lewis (1967); Davies R. L. (1969a); Davies and Briggs (1967); Davies, Giggs and Herbert (1968); Dommer and Cundiff (1967); Dutt (1966, 1969); Friedly (1965); Garner (1967, 1968); Goddard (1970); Gruen and Gruen (1967); Hayes and Schull (1965); Horton (1968); Johnston (1966c); Johnston and Rimmer (1967a); Jones (1967); Laulajainen (1968); McEvoy (1968); Nystuen (1967); Parker (1962); Pocock (1968); Rogers (1968); Schull and Hayes (1965); Simmons (1966); Thompson (1966); Thorpe (1967); Thorpe and Rhodes (1966).

II. STUDIES OF SPATIAL INTERACTION AND BEHAVIOUR IN TERTIARY ACTIVITY SYSTEMS

a) inter-urban activity systems

Andrews (1970); Berry (1966); Brush and Gauthier (1968); Clark (1968); Clarke and Bolwell (1968); Daly and Brown (1965); Davies and Robinson (1968); Dorman (1967); Folke (1967); Golledge, Rushton and Clark (1966);

Greer-Wootten (1968); Hautamaki (1968); Heller (1969); Hoover (1969); Illeris and Pedersen (1968); Janelle (1969); Johnsson (1968); Johnston (1966b, 1968); Kar (1963); King, Cassetti and Jeffrey (1969); Kissling (1969); Lachene (1965); Macka (1967); Manchester University (1964); Marshall (1969); Murdie (1965); O'Farrell (1965); Ray (1967); Reynolds (1966, 1969a); Rushton, Golledge and Clark (1967); Suento (1965); Thompson (1966); Thorpe and Nader (1967); Tornqvist (1968); Woolmington (1968).

b) intra-urban tertiary activity system

Alcaly (1967); Ambrose (1968); Andrews (1970); Baker (1969); Blount (1964); Boyce (1965); Bucklin (1966, 1967); Davies, R. L. (1968, 1969b); Eilon et al. (1969); Eliot Hurst (1969); Eliot Hurst and Sellers (1969); Farley and Ring (1966); Feldman (1966); Goddard (1970); Hanson and Marble (1969); Hess (1966); Horton (1968); Huff (1966); Huff and Jenks (1968); Johnston and Rimmer (1967b) Marble (1964, 1967); Marble and Bowlby (1968); Moore (1966); Nader (1969); Nystuen (1967); Pocock (1968); Pryor (1968); Schull and Hayes (1965); Simmons (1968); Sparico (1966); Stone (1963); Thompson (1966); Yuill (1967).

III. STUDIES OF SYSTEM CHANGE

a) inter-urban

Brunn (1967); Curry (1969); Daly and Brown (1965); Fugitt (1965); Hart and Salisbury (1965); Harvey (1967); Hill (1967, 1969); Hodge (1966, 1967); Hudson (1967b, 1969a); Janelle (1969); Johnston (1968); Marshall (1969); Mark and Schwiran (1967); Medvedkov (1968); Roder (1969); Scott (1968); Singh S. M. (1965); Smith J (1965); Smith R.D.P. (1968); Stiglbauer (1966); Teitz (1968a); Thomas (1967b).

b) intra-urban

Ball (1966); Bengtsson (1967); Bowlby (1967); Cohen and Lewis (1967); Davies and Briggs (1967); Forbes (1967); Forest (1968); Rhodes and Whitaker (1967a,b); Russworm (1964); Simmons (1966); Tietz (1965).

IV. APPLICATIONS FOR PLANNING AND PLANNED SYSTEMS

a) mainly inter-urban

Berezowski (1967); Boal and Johnson (1965); Bobek (1967); Boudeville (1965); Christaller (1965, 1966); Cole (1966); Curdes (1967); Davies and Robinson (1968); Haggett and Gunawardena (1964); Hodge (1967, 1968); Huff (1966); Huff and Blue (1966); King, Cassetti and Jeffrey (1969); Lakshmanan and Hanson (1965); Lomas (1964); Macka (1967); Manchester University (1964); Mycielski and Trzeciakowski (1963); Stiglbauer (1966); Stuan (1967); Uladimirov et al. (1967).

b) mainly intra-urban

Andrews (1967); Applebaum (1966); Berry (1966a); Carol (1969); Cordey Hayes (1968); Horton (1967); Medvedkov (1967c); Rhodes and Whitaker (1967a,b).

V. THEORETICAL EXTENSIONS

a) formalization of spatial organization and spatial relations

Berry (1968a, b); Bunge (1966); Dacey (1964c,d, 1965a,b); Dacey and Sen (1968); Gambini et al. (1968); Hudson (1967a, 1969b); Medvedkov (1968); Papageorgiou (1969); Rydell (1967); Sweet (1964); Waldenberg (1968).

b) probabilistic bases for spatial organization and spatial relations

i) probabilistic interpretations of spatial structure

Curry (1964, 1966, 1967, 1969); Dacey,(1964a,b,c, 1965c,d,e,f, 1966a,b,c,d, 1967, 1968a,b,c,d,e, 1969a,b,c,d,e, 1970a,b); Getis (1967); Greer-Wootten (1968); Harvey (1967); Hudson (1967b, 1969a); Medvedkov (1967a,b); Olsson (1965a,b, 1966); Parr (1969b); Rogers (1965); Thomas (1967a); Tiedmann (1968).

ii) probabilistic interpretations of spatial interaction

Curry (1967, 1969); Gambini et al. (1968); Greer-Wootten (1968); Harris (1964, 1968a,b, 1969a); Harvey (1968); Hudson (1969c); Marble (1967); Olsson (1966); Wilson (1967 , 1969).

c) links to spatial economic theory

Blackburn (1969); von Boventer (1963, 1966, 1969); Christaller (1964);

Gannon (1969); Harvey (1969); Lachene (1965); Niedercorn and Bechdolt (1969); Ruston (1969a); Sweet (1964); Teitz (1968a,b); Tornqvist (1968); Webber (1969).

d) links to psycho-social studies

Ajo (1969); Andrews (1970); Golledge and Brown (1967); Gruen and Gruen (1967); Harvey (1969); Olsson (1969a,b); Rushton (1966, 1969a,b).

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